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(54) Injection molding machine

(57) An injection molding machine includes a multi-configuration cavity in its dies whereby a first part 36 and

carrier strip 62 are molded in one part of the die, and then indexed to another part of the die by means of a transfer blade 44, a second part 42 then being molded over the first part.

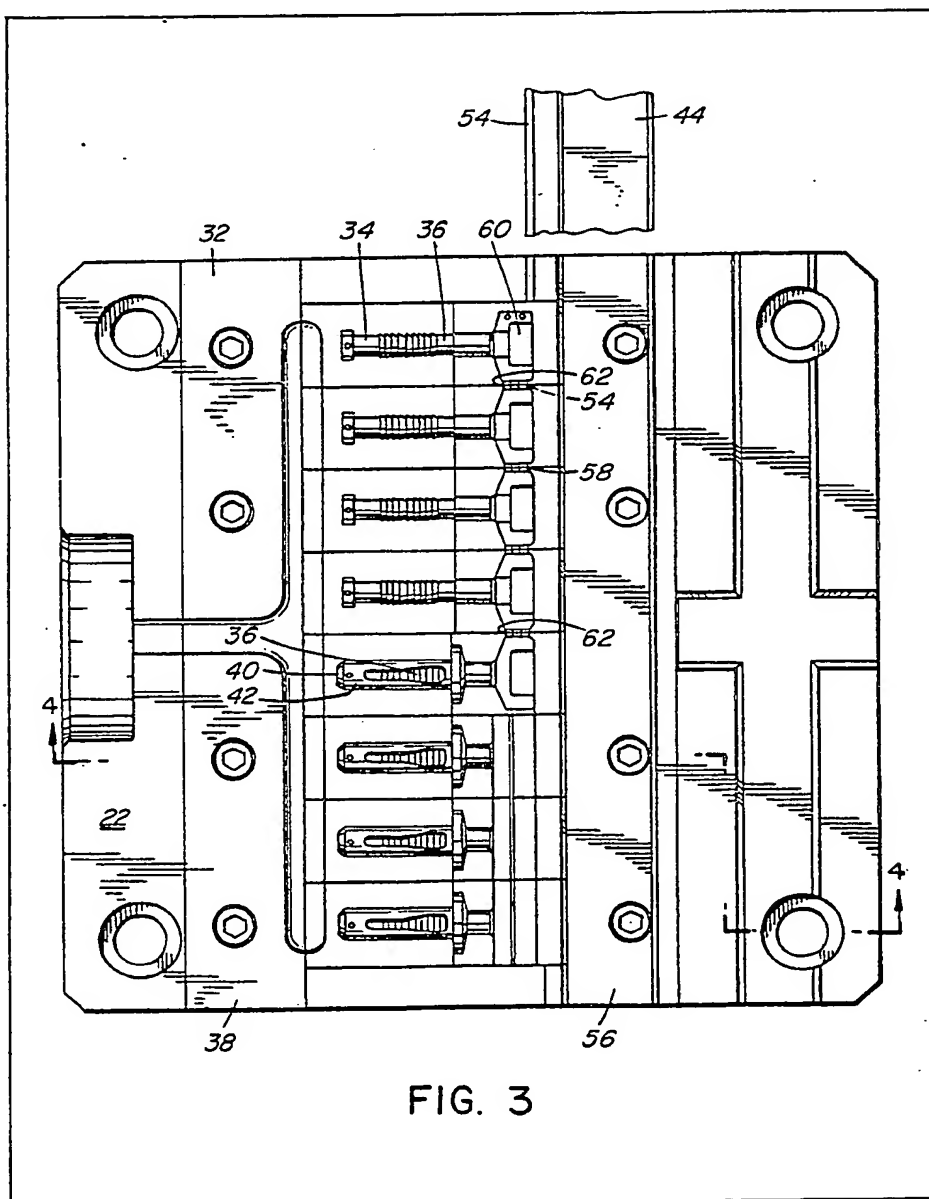


FIG. 3

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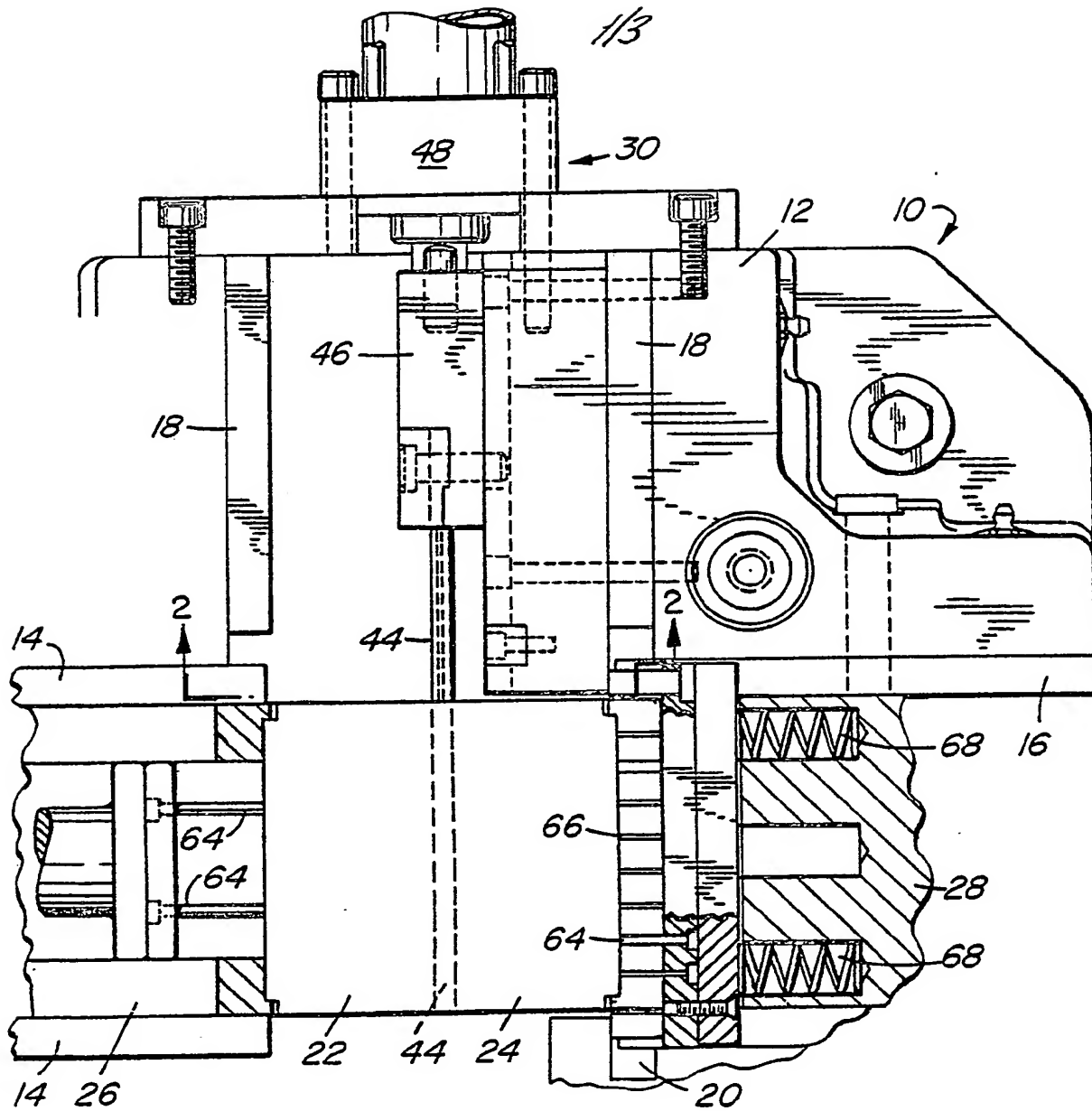


FIG. 1

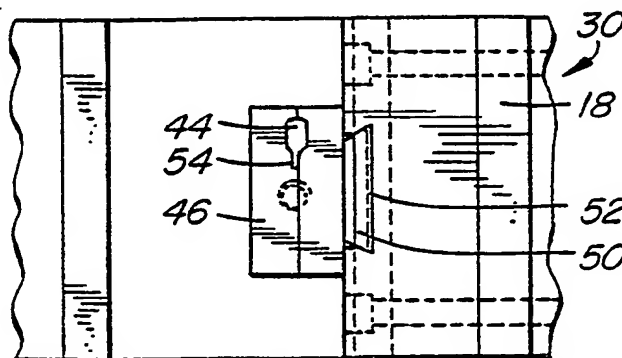


FIG 2

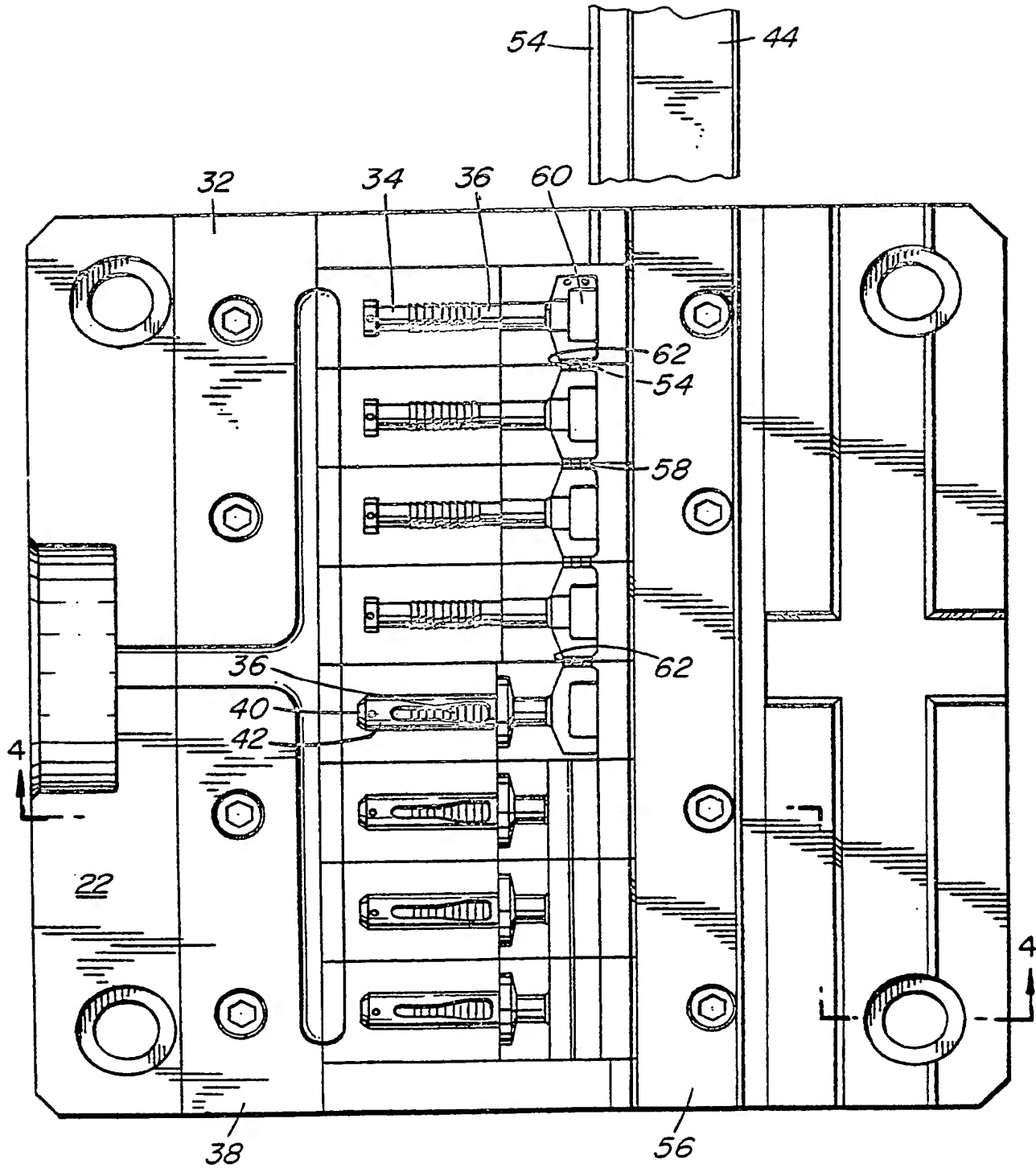


FIG. 3

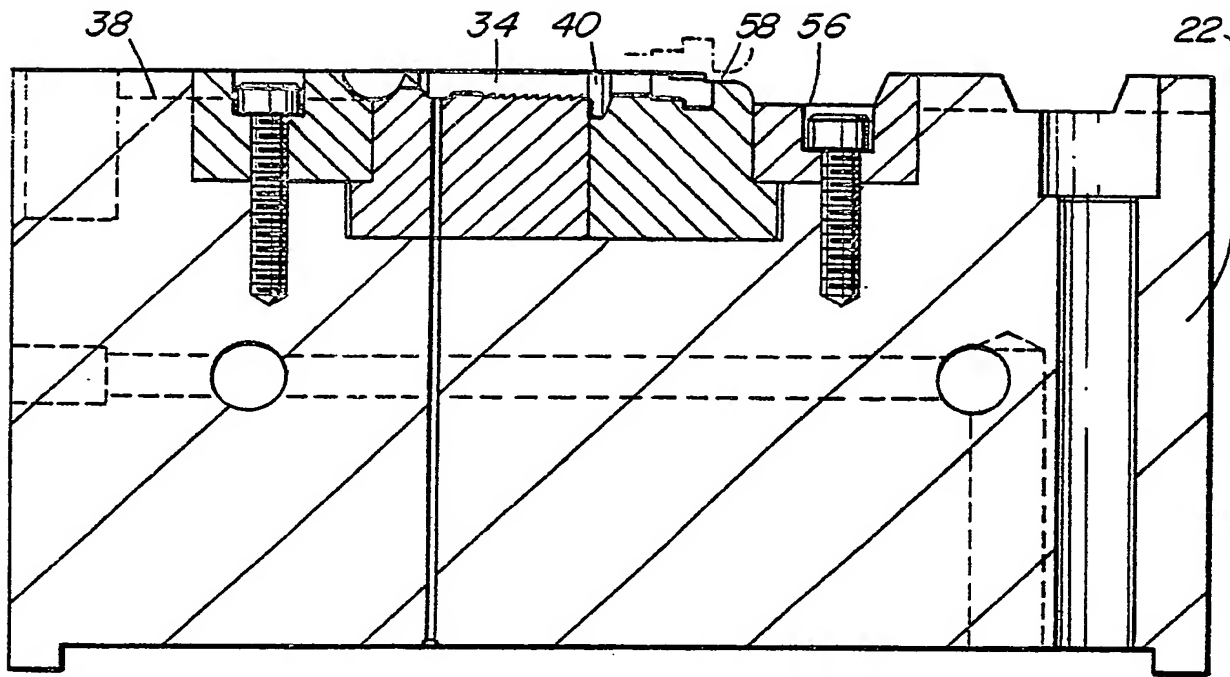


FIG. 4

## SPECIFICATION

## Plastic injection molding machine

This invention relates to injection molding machines and in particular to a plastic injection apparatus for use in a molding machine in which a first part is molded on to the carrier strip and transferred to a second position in a mold for the over molding of a second part.

There are numerous products produced by the plastics industry which have at least two parts that conventionally are molded separately and subsequently joined together in an assembly operation. The present invention provides a forward step in this art by molding the two parts in one operation with an interconnecting carrier or orientation strip. With the method and apparatus of the present invention, the conventional assembly step using at least one further machine is unnecessary.

The molding of the parts with the carrier strip proves most useful in the subsequent use of the parts as the carrier strip is used to maintain the orientation of the parts for use in their assembly or insertion in an associated device. The orientation strip therefore facilitates the assembly of small components, one with the other.

In its simplest form, the process of the present invention consists of molding a first part integrally with a carrier strip and indexing this first unit and the strip to another part of the die so that, on the next shot, a second unit is molded over and interlocked to the first unit.

According to one aspect, the method of molding a multi-part article in a plastic injection molding machine comprises the steps of molding a first part integrally with a carrier strip in one section of a die, indexing the molded strip and first part to another section of the die and molding a second part over the first part while simultaneously molding another first part and carrier in the first part of the die.

According to another aspect, the invention relates to apparatus for injection molding a part integrally with a carrier strip and which comprises a pair of mold halves which, when reciprocated into face to face relation, form a plurality of cavities therein. The mold halves include at least one cavity for molding a first part with an integral carrier strip and at least one other cavity in the mold for molding a second part over the first part. Means for transferring the first molded part and the carrier strip from the first cavity to the other cavity is also provided.

The invention is illustrated by way of example in the accompanying drawings in which Figure 1 is a fragmented elevation view of an injection molding machine incorporating the present invention;

Figure 2 is an end view of the transfer means as viewed generally along the lines 2—2 of Figure 1;

Figure 3 is a plan view of one of the mold halves used in the present invention; and

Figure 4 is a sectional view taken along the lines 4—4 of Figure 3.

Referring to Figure 1, a plastic injection molding machine indicated generally at 10 includes a multi-slide die guide of the type shown in my U.S. Patent issued

Die guide 12 has a pair of slideways 14, 16 and a further pair 18, 20 at right angles to the first pair. As shown in Figure 1, a pair of mold halves 22, 24 are mounted on shanks 26, 28 respectively for reciprocal movement in the guideways 14 and 16 by suitable driving means, not shown. When the mold halves 22, 24 are brought together they form closed cavities therebetween for the reception of plastic injection.

Slide guideway 18 is used for the mounting of a transfer mechanism generally indicated at 30, the purpose and operation of which will be described further on in the disclosure.

Referring to Figure 3, mold half 22, like its companion half 24, not illustrated, has a first section 32 with at least one cavity 34 therein for molding the first part 36 of an article. Mold 22 also includes a second section 38 having at least one cavity 40 for the molding of a second part 42 on top of the first part 36. After the first part 36 is molded in the cavity 34, the part 36 is moved from the first section 32 of the mold to the second section 38 of the mold into cavity 40 where the second part 42 is molded over the first part. This movement is carried out by means of a transfer blade 44 which, as shown in Figures 1 and 2, has its upper end secured in a blade clamp 46 at the upper end of which is detachably connected to a linear actuator 48. Clamp 46 is provided with a dove-tail shaped guide 50 as shown in Figure 2 which cooperates with a track 52 of similar configuration, this track being bolted as illustrated to one side of the guideway 18. It will be appreciated that as the linear actuator 48 is operated the clamp 46 and blade 44 are moved upwardly or downwardly along the track 52. It will be seen in Figure 2 that the transfer blade 44 has a part-engaging edge 54.

Referring now to Figures 3 and 4, it will be seen that the mold half 22 includes a track 56 for the blade 44, the part engaging edge 54 thereof being adapted to be positioned in the area 58 of the mold so that, when the first part 36 is molded, the head portion 60 of the part will be molded around the edge 54 of the blade as shown in phantom line in Figure 4. Part 36 is therefore molded integrally both with a carrier strip 62 interconnecting the first parts 36 and also around the edge 54 of the transfer blade. After the first shot into the molds 22, 24 is made, forming the first parts 36, mold half 22 is opened (to the left in its guideway 14) the parts 36 being released from the cavities 34 by ejector pins 64. Mold 24 is then opened (to the right and guideway 16) and the parts are released therefrom by ejector pins 64 and 66, these pins being actuated by the interaction of the mold half 24 with the pin release springs 68. Actuator 48 is then operated to move the clamp 46 and transfer blade 44 downwardly (as seen in Figure 1) so that the parts 36 molded about the edge 54 of the blade are indexed downwardly so that they are in

alignment with the cavities 40 in the second section of the mold 22, the parts 36 being maintained in proper orientation due to their interconnection by the carrier strip 62 and the blade edge 54. Mold 24 is then closed followed by mold half 22, the blade 44 is drawn upwardly to its Figure 1 position by the actuator 48, the edge 54 breaking away from the notch in the heads 60 of the part. Another shot is then made into the mold cavities, molding the second part 42 over the first part 46 in the cavities 40 in the second section of the mold while at the same time another series of first parts 36 are molded about the edge 54 of the blade 44. The cycle is then repeated.

While the invention has been described in connection with a specific embodiment thereof and in a specific use, various modifications thereof will occur to those skilled in the art without departing from the spirit and scope of the invention as set forth in the appended claims.

The terms and expressions which have been employed in this specification are used as terms of description and not of limitation, and there is no intention in the use of such terms and expressions to exclude any equivalents of the features shown and described or portions thereof, but it is recognized that various modifications are possible within the scope of the invention claimed.

### 30 CLAIMS

1. The method of molding a multi-part article in a plastic injection molding machine comprising the steps of:
  - molding a first part integrally with a carrier strip in one section of a die, indexing the molded strip and part to another section of the die and molding a second part over the first part while simultaneously molding another first part and carrier in the first section of the die.
2. Apparatus for injection molding a part integral with a carrier strip comprising a pair of mold halves which, when reciprocated into face to face relation, form a plurality of cavities therein; said mold halves including at least one cavity for molding a first part with an integral carrier strip; at least one other cavity for molding a second part over the first part; and means for transferring the

first molded part and carrier strip from the first cavity to the other cavity.

3. Apparatus according to Claim 2 wherein the transferring means is operative in a plane 90° to the plane of operation of said molds and comprises a ram having a reciprocating piston rod, a blade carrier secured to one end of the rod, a transfer blade having one end mounted in said carrier with the other end thereof extending downwardly for positioning between said mold halves, and a guide track for directing movement of said carrier.
4. A method of injection molding a multi-part article substantially as hereinbefore described with reference to and as illustrated in the accompanying drawings.
5. Injection molding apparatus substantially as hereinbefore described with reference to and as illustrated in the accompanying drawings.
6. Articles produced by the method and apparatus as claimed in Claims 4 and 5.

New claims or amendments to claims filed on 24th May 1982.

Superseded claims 1 and 2.

New or amended claims:—

1. A method of molding a multi-part article in a plastic injection molding machine comprising the steps of:
  - molding a first part integrally with a carrier strip in one section of a die, indexing the molded strip and part to another section of the die and molding a second part over the first part while simultaneously molding another first part and carrier in the first section of the die, both molding steps being produced by the same injection unit.
2. Apparatus for injection molding a part integral with a carrier strip comprising a pair of mold halves which, when reciprocated into face to face relation, form a plurality of cavities therein; said mold halves including at least one cavity for molding a first part with an integral carrier strip; at least one other cavity for molding a second part over the first part; means for transferring the first molded part and carrier strip from the or each first cavity to the or each other cavity; and a single injection unit for injecting the first and second parts.